

## CLAIMS

What is claimed is:

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1. A rebreather apparatus comprising:
  - means for providing breathable gases to a user of the apparatus and transporting gases exhaled by the user to a medium for removing unwanted elemental molecules from the exhaled gases;
  - means for providing compressed gases to the apparatus;
  - means for monitoring the gases circulating through the apparatus and controlling the addition of compressed gas to the apparatus;
  - a gas scrubber canister having at least one removable end caps and a cross sectional shape selected from the group of shapes consisting of an oval and an ellipse;
    - the at least one removable end caps being located one at each end of the gas scrubber canister;
    - the at least one end cap configured for watertight attachment to the gas scrubber canister;
    - the gas scrubber canister configured for securing a disposable adsorbent material, used to remove unwanted elemental molecules from the exhaled gases, in the interior thereof;

the gas scrubber canister having a generally hollow interior tube located in the approximate center thereof, the tube having the same cross sectional shape as the gas scrubber canister and configured to allow gases to pass radially through the walls of the tube;

the gas scrubber canister being further configured such that when the adsorbent material is placed in the gas scrubber canister, there is a generally uniform space between the canister wall and the adsorbent material throughout the portion of the canister containing the adsorbent material such that gases will pass radially through the adsorbent material between the hollow tube and the space between the canister wall and the adsorbent material; and

the apparatus further comprising a means for securing the apparatus to the body of a user of the apparatus.

2. The apparatus of claim 1 wherein the at least one removable end cap is configured for placing a gas monitoring and control system therein.
3. The apparatus of claim 2 wherein the at least one removable end cap is two end caps such that the scrubber canister has two removable end caps.
4. The apparatus of claim 3 wherein both removable end caps have a gas monitoring and control system inserted therein.

5. A rebreather apparatus comprising:
- a gas supply circuit having a mouthpiece, an inhalation portion, an exhalation portion and at least one counterlung;
    - the inhalation portion and the exhalation portion each having at least one gas conduit;
    - the mouthpiece being connected to the inhalation portion and the exhalation portion and configured to allow inhalation of gases from the inhalation portion and exhalation of gases into the exhalation portion;
  - a source of compressed gas;
    - the source of compressed gas being in communication with the gas supply circuit by at least one compressed gas conduit;
  - at least one control system for monitoring the gases circulating through the gas supply circuit and controlling the addition of compressed gas into the gas supply circuit;
  - a gas scrubber canister having at least one removable end cap, a removable insert secured in the interior thereof such that there is a generally uniform space between the wall of the canister and the insert, and a cross sectional shape selected from the group of shapes consisting of an oval and an ellipse;
    - the at least one removable end cap being located one at each end of the gas scrubber canister;
    - the at least one removable end cap configured for water tight attachment to the gas scrubber canister and connection to the gas supply circuit via the

gas conduits of the inhalation portion and the exhalation portion of the gas supply circuit;

the insert configured for holding a disposable adsorbent material used to remove unwanted elemental molecules from the gas supply circuit;

the insert having a generally hollow tube in the approximate center thereof and a plurality of holes therethrough to allow gases to pass through the insert and the gas scrubbing medium;

the insert further configured such that when the insert is secured in the gas scrubber canister and filled with an adsorbent material ; the at least one removable end cap is placed on the gas scrubber canister and connected to the gas supply circuit; gases will pass radially through the insert and adsorbent material between the hollow tube and the space between the canister wall and the insert; the insert, and the hollow tube having the same cross sectional shape as the gas scrubber canister; and

the apparatus further comprising a harness for securing the apparatus to the body of a person using the apparatus.

- 6 The apparatus of claim 5 wherein the at least one removable end cap is configured for placing a gas monitoring and control system therein.
- 7 The apparatus of claim 6 wherein the at least one removable end cap is two end caps such that the scrubber canister has two removable end caps.

- 8 The apparatus of claim 7 wherein both removable end caps have a gas monitoring and control system inserted therein.
9. The apparatus of claim 5 wherein the apparatus is configured such that the gas scrubber canister is worn on a diver's back.
10. The apparatus of claim 9 wherein the long axis of the canister is parallel with the long axis of the diver's body.
11. The apparatus of claim 5 where in the apparatus is configured such that the gas scrubber canister is worn on the front of a diver's body.
12. A rebreather apparatus comprising:
  - a gas supply circuit having a mouthpiece, an inhalation portion, an exhalation portion and at least one counterlung;
  - a source of compressed gas that is in communication with the gas supply circuit through at least one compressed gas conduit;
  - at least one control system for monitoring the gases circulating through the gas supply circuit and controlling the addition of compressed gas into the gas supply circuit;
  - a gas scrubber canister having a pair of removable end caps, a removable insert secured in the interior thereof such that there is a generally uniform space between the wall of the

canister and the insert, and a cross sectional shape selected from the group of shapes consisting of an oval and an ellipse;

the pair of removable end caps being located one at each end of the gas scrubber canister;

each end cap configured for water tight attachment to the gas scrubber canister and connection to the gas supply circuit via the gas conduits of the inhalation portion and the exhalation portion of the gas supply circuit; each end cap being further configured such that the at least one automatic control system can be housed therein and the at least one compressed gas conduit can be connected thereto;

the insert configured for holding a disposable adsorbent material used to remove unwanted elemental molecules from the gas supply circuit; the insert having a generally hollow tube in the approximate center thereof and a plurality of holes therethrough to allow gases to pass through the insert and the adsorbent material;

the insert further configured such that when the insert is secured in the gas scrubber canister and filled with an adsorbent material; and the end caps are placed on the gas scrubber canister and connected to the gas supply circuit; gases will pass radially through the insert and the adsorbent material between the hollow tube and the space between the canister wall and the insert; the insert, and the hollow tube having the same cross sectional shape as the gas scrubber canister; and

the apparatus further comprising a means for securing the apparatus to the body of a person using the apparatus.

- 13 The apparatus of claim 12 wherein the removable end caps are configured for placing a gas monitoring and control system therein.
14. The apparatus of claim 13 wherein at least one of the removable end caps has a gas monitoring and control system inserted therein.
15. The apparatus of claim 12 wherein the end caps have two flexible O-rings disposed thereon such that each O-ring creates an individual seal between the end caps and the scrubber canister, and the two O-rings create a water tight seal between the end caps and the scrubber canister.
16. The apparatus of claim 12 wherein the apparatus can be easily reconfigured such that position that the gas scrubber canister and the compressed gas source are worn on the diver's body can be changed.